

CHAPTER 1

INTRODUCTION TO THE TITLE ACT STUDY

In defining the Title Act Study in Senate Bill 2030, the California Legislature specified a series of tasks that, together, would lead to recommendations for change in licensing the state's engineers. These tasks included:

- Meeting with representatives of the engineering branches and other professional groups.
- Examining the types of services provided by different branches of engineering.
- Reviewing and analyzing educational requirements for the separate engineering disciplines.
- Identifying the amount of overlap between engineering disciplines.
- Reviewing alternative methods of regulation in other states and assessing the impact these regulations would have if adopted in California.
- Describing the manner in which local and state agencies utilize regulations and statutes to regulate engineering work.
- Recommend changes to existing laws regulating engineers after considering how these changes may affect the health, safety and welfare of the public.

ISR assembled as much information pursuant to these tasks as possible within the time available. Some of the information necessary to fully satisfy the legislative requests outlined above was either proprietary (e.g., job analyses performed by private firms for NCEES, insurance rates and claims data for different types of engineers), not publicly available (e.g., national and state pass rates for NCEES exams), or inadequately defined and administered (e.g., state data on complaints against engineers). The unavailability of good information on a profession with significant impact on the public health, safety and welfare limits accountability in the exercise of that profession. Lack of accountability itself threatens the public's health, safety and welfare.

Underlying these tasks were several overarching concerns. The first was the amount of overlap between engineering disciplines regulated in California. Overlap occurs in the coursework required for degrees in different branches of engineering, in the work that employed engineers perform (formally measured through NCEES sponsored job analyses), in the NCEES exams used in licensing engineers that are based on job analyses, and in state regulatory structures that either permit or disallow the performance of work outside areas defined by educational preparation, the NCEES exams taken and/or subsequent work experience. The second overarching concern was whether there were sufficient distinctions between California's practice and title act disciplines to justify maintenance of its existing and unique regulatory structure. No other state allows unlicensed persons to practice any branch of engineering. Only California licenses use of a title, but permits unregulated practice of all but three engineering disciplines (Civil, Electrical and Mechanical). The third concern was whether this regulatory structure adequately protects the public health, safety and welfare and whether a differential impact on public health, safety and welfare, if any, might be one justification for the practice/title distinction.

Significant findings from the analysis of educational requirements, job task profiles, examination outlines, pass rates, engineering employment and registration patterns, exemptions, complaints and insurance claims are discussed in the data Chapters 3-10 and summarized in Chapter 11 in sections corresponding to the three overarching concerns.

Comparisons with ten other states and analysis of the treatment of engineering disciplines in California state and county codes (the California Code of Regulations (CCR) and those for Los Angeles, San Diego and San Francisco counties) and the Federal Code of Regulations (FCR) were used to create a context for understanding California's licensing system.

Methodology

Ten comparison states were selected based on population, density, percent urban, and amount of residential and commercial construction and regulatory model. These ten states were surveyed about their regulatory structure and asked to provide registration, exam and complaint data. States were classified as either discipline-based licensing or generic licensing states. States were also classified as either board-dominated or agency-dominated states. The ten comparison states were also asked to consent to NCEES providing ISR with exam data. Existing data from the OES survey, the US Census and the Economic Census was used to get an estimate of the number of employed engineers, employment location and to compute registration rates. Exam pass rates were converted to standard normal Z-scores to show California's relative placement in comparison to the ten other states. The Z-test of proportions was used to compare the pass rates of discipline-based licensing states vs. generic licensing states and board-dominated vs. agency-dominated states.

Two sources of data served as imperfect indicators of the relative impact on public and safety of different engineering disciplines. Data on the number and dollar value of insurance claims relative to client fees generated by engineering firms involved in claims was made available by DPIC, a major insurer of engineers. The power presentation also included limited information on types of damages, suing parties and project types involved in claims. Data on complaints filed against engineers were used as a second indicator of impact on public health, safety and welfare. California, Massachusetts, New York, North Carolina and Texas provided information in varying depths on complaints in their states. California provided the most detailed information, allowing summaries of the source, nature and disposition of the complaint by engineering discipline. Wherever possible, comparisons were made with the other states. Complaint rates were computed using number of registered engineers as the base for complaints against licensed engineers and the number of employed engineers as the base for complaints against the unlicensed.

The uses of licensing by federal, state and local agencies were explored through several online searches. The Federal and California state and county codes of regulation were searched for references to engineers and the State Personnel Board's online Classification Information Search System searched for registration requirements associated with engineering job classes. Finally, information from the State personnel Board's Report 5102 was used to describe the proportion of registered engineers among the permanent civil service employees in engineering job classes.

Overlap between engineering disciplines was examined by looking at educational requirements and NCEES exam outlines. The original intent was to explore discipline overlap through the comparison of NCEES and California job analyses. Due to the unavailability of job analysis data for many disciplines and lack of comparability in those that were available, use of job analyses data and reports was limited to preparation of task profiles for each of the engineering disciplines. Educational requirements were compared using degree requirements in online catalogues from the seven largest engineering schools in California. Undergraduate and graduate degrees and specializations for the currently regulated disciplines were used to

compare the degree of overlap in engineering and non-general education supporting units between engineering disciplines. Subject matter experts were selected to review NCEES exam outlines and compare content on paired discipline exams. The results of the SME's reviews were used to calculate overlap between disciplines in exam content.

Data Sources Used

- State Occupation Employment Statistics Survey 1998
- National Occupation Employment Statistics Survey 1988-90, 1998, 1999 and 2000
- US Census 1990 and 2000
- Economic Census 1997
- ISR State Board Survey, 2000
- NSPE Engineering Licensure Laws Summary and Analysis 2001
- NCEES 2000 Survey
- California BPELS Survey
- Registration data, 1994/1995- 2000/2001 (California and eight comparison states)
- NCEES exam pass rate data 1997-2001
- DPIC Power Point presentation on insurance claims 1989-2001
- Complaint Data 1991-2001 (California, New York)
- Complaint Data 1988-2001 (Massachusetts)
- Complaint Data 1997/1998 and 1999/2000 (North Carolina, Texas)
- California Code of Regulations (CCR), county codes for Los Angeles, San Diego and San Francisco and the Federal Code of Regulations (FCR)
- California State Personnel Board's online Classification Information Search System
- California State Personnel Board Report 5102
- Degree requirements from the seven largest engineering schools in California for 2001
- Job Analysis reports and raw data for the Agricultural, Electrical, Mechanical, Metallurgical, Petroleum and Structural engineering exams
- Job Analysis reports only for the Chemical, Civil, Control Systems, Geotechnical, Industrial, Manufacturing, Special Civil, and Traffic engineering exams
- Subject Matter Experts' review of NCEES exam outlines

Outline of the Report

Chapter 2 reviews the relevant literature on the regulation of occupations and the justification for licensing.

The history of engineering licensing in California and a comparison of regulatory structure between California and ten economically and demographically comparable states is described in **Chapter 3**.

Differences in engineering disciplines are examined through employment estimates, employment location and registration rates nationally and for California and its ten comparison states in **Chapter 4**.

Standard normal Z-scores are used to compare California's pass rates for the Fundamentals and Principle & Practice specialty NCEES exams to the average pass rate for the comparison states in **Chapter 5**.

Differential impact of engineering disciplines on public health, safety and welfare is analyzed using insurance claims and complaint data in **Chapter 6**.

Treatment of engineering disciplines in the California Code of Regulation (CCR), county codes for Los Angeles, San Diego and San Francisco and the Federal Code of Regulations (FCR), and registration requirements for State Personnel Board engineering job classes are described in **Chapter 7**.

Overlap between disciplines in engineering and non-general education supporting units is analyzed for the seven largest engineering schools in California in **Chapter 8**.

Discipline task profiles based on NCEES and California job analyses are described in **Chapter 9**.

Overlap identified in NCEES exam content by subject matter experts is analyzed in **Chapter 10**.

Chapter 11 summarizes the findings of data Chapters 3-10 and the implications of the findings.

Recommendations for changes to the California's licensing structure and the impact of those changes are discussed in **Chapter 12**.